I. Reading:

- Patty, Appendices A, B, C, D, E, F, G.
- Supplementary handout: *Background Material from Elementary Real Analysis.*
- Patty, §§1.1, 1.2.

II. Practice problems:

1. Patty, Exercises A (pp. 298–299) #1, 2.
2. Patty, Exercises B (pp. 303–304) #3, 4.
3. Patty, Exercises C (pp. 309–310) #1, 2, 5, 6, 8, 10.
4. Patty, Exercises E (p. 319) #2.
5. Patty, Exercises F (pp. 322–323) #4, 5, 13.

III. Required problems:

1. Patty, Exercises C (p. 309) #4.
2. Patty, Exercises E (p. 319) #3.
3. Patty, Exercises E (p. 319) #7.
4. Patty, Exercises F (p. 323) #7.
5. Patty, Exercises G (p. 325) #2.
6. If \( a, b \) are any real numbers with \( a < b \), show that there exist both an irrational number \( x \) and a rational number \( y \) such that \( a < x < b \) and \( a < y < b \).
7. Define a function \( f : \mathbb{R} \to \mathbb{R} \) by \( f(x) = x^2 \). Prove directly from the definition of continuity that \( f \) is continuous.
8. Prove that every positive real number has a unique positive square root. More precisely, if \( x \in \mathbb{R} \) and \( x > 0 \), show that there exists a unique \( y \in \mathbb{R} \) such that \( y > 0 \) and \( y^2 = x \).
9. Suppose \( a, b \) are real numbers such that \( a < b \), and \( f : [a, b] \to \mathbb{R} \) is a continuous function such that \( \int_a^b |f(x)| \, dx = 0 \). Show that \( f \) is identically zero.
10. Let \( \langle x_i \rangle \) be a sequence of real numbers, and suppose that it is nondecreasing (meaning that \( x_{i+1} \geq x_i \) for every \( i \in \mathbb{N} \)) and bounded above (meaning that there is a real number \( B \) such that \( x_i \leq B \) for all \( i \)). Prove directly from the definition of convergence that \( \langle x_i \rangle \) converges to a real number \( x \leq B \).